Volumetric Properties of Tetraethylene Glycol Dimethyl Ether + Heptane up to 25 MPa

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The molecular interpretation of systems containing a polar component and an alkane has been the subject of much controversy. For these studies only experimental values of thermodynamic properties at atmospheric pressure have been used. Therefore, it is interesting to have supplementary high-pressure measurements that can be useful for the interpretation of the thermodynamic properties of these kinds of mixtures. Thus, in a previous paper the pVTx experimental values for dimethyl carbonate + octane were reported [1]. In the case of the binary mixtures of polyalkylene glycol dimethylethers, $CH_3O-((CH_2)_2O)n-CH_3$ with alkanes, several studies on the effect of the molecular structure on their thermodynamic properties have been carried out at low pressures [2]. In this work extensive density measurements for the tetraethylene glycol dimethyl ether + heptane system over all the composition range, between 278.15 K and 353.15 K and for pressures up to 25 MPa are reported. These experimental values were obtained with a vibrating-tube densimeter with an experimental uncertainty of $\pm 10^{-4}$ g·cm^{-3}. For each mole fraction, the pVT data was represented by a modified Tait equation. From the volumetric results we have determined the isothermal compressibility, the isobaric expansivity and the internal pressure. The effect of the systematic variation of the polyether mole fraction on these derived thermodynamic properties has been analyzed. The excess volumes are positive, decreasing with the pressure.

[1] L. Lugo, M. J. P. Comuñas, E. R. López, and J. Fernández, Fluid Phase Equilib., 186 (2001) 235-255.
[2] L. Andreoli-Ball, L. M. Trejo, M. Costas, and D. Patterson, Fluid Phase Equilib., 147 (1998) 163-180.